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ENGINEERING PROJECT MANAGEMENT: THE IPQMS METHOD AND CASE HISTORIES

By

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PREFACE AND ACKNOWLEDGMENTS

This book is based on the results of an intensive study of programs and projects in nine countries by an international, multidisciplinary team. The purpose of the study was to determine the reasons for budget overruns and other costly mistakes, and then to recommend solutions. Particular attention was devoted to private and public works projects which are basic to the needs of both developing and developed countries: infrastructure-related projects.

The most critical problem area in every case was related to the fragmented approach to planning, design, and management of implementation. Thus, the integrated planning and quality management system (IPQMS) was developed, tested, refined, and implemented. The international team designed and tested a new curriculum for education and training of project managers. The cornerstone of the curriculum is a series of case histories researched and published in the IPQMS framework. IPQMS case histories represent autopsies or postmortems, providing useful lessons for all new programs and projects, and troubleshooting projects in progress.

Experience with the IPQMS since its development clearly demonstrates its versatility and strength in providing the necessary leadership and control of the various tasks in the entire project cycle. IPQMS case histories provide a scientific basis for preparing guidelines and checklists for programs and projects in both government and industry. These guidelines and checklists prevent waste, fraud, and mismanagement — thereby ensuring total quality and cost effectiveness. For example, it is estimated that use of the IPQMS system and lessons from past projects such as the Trans-Alaska Pipeline System will result in annual savings of at least 10 percent or approximately \$60 billion in the construction industry alone (1996 estimates).

The authors have used the IPQMS methodology to study the problems responsible for waste, fraud, and mismanagement in the federal government. In addition, they have recently completed IPQMS postmortems of programs and projects in the context of public health and safety: (1) the operation of the Trans-Alaska Pipeline System, (2) the Environmental Protection Agency (EPA) Superfund Programs 1 to 3, and (3) the Hanford Nuclear Reservation. These postmortems emphasize the need for accountability and quality in both industry and government.

Chapter 1 presents an overview of the deteriorating condition of our physical infrastructure, covering transportation, water supply systems, wastewater treatment plants, and public school buildings. It also covers the environment, with special attention to hazardous waste contamination and related public health problems. The need for infrastructure renewal is discussed in the context of construction industry issues. These issues, especially teamwork and accountability, must be resolved

before rebuilding America. Otherwise, the on-going fragmentation of the construction industry will make the task cost prohibitive.

Chapter 2 introduces the Integrated Planning and Quality Management System (IPQMS), a new methodology to ensure teamwork, accountability, cost effectiveness, and quality. It was developed, tested, and refined based on analyses of postmortems of over 30 programs and projects in nine countries by an international team of scholars and practitioners. There is a special focus on feasibility studies, which are vital to every phase and task of the IPQMS. The feasibility studies serve as the basis for guidelines and checklists to ensure fail-safe implementation.

Chapter 3 discusses the IPQMS and case materials. Definitions of case studies and case histories are presented. IPQMS case histories represent autopsies or postmortems of past programs and projects, and are therefore in-depth analyses of why projects failed. They are a record of events and issues that actually were faced by managers during the planning, design, and implementation of the projects. Thus, the case histories are much more comprehensive than conventional case studies. The lessons learned from the postmortems are invaluable for organizing project teams and providing quality management. The need to teach teamwork and ensure accountability is emphasized. The chapter concludes with a discussion of how to use IPQMS case histories in both the classroom and in practice.

Chapter 4 presents general guidelines and questions for researchers and writers of case histories of projects in all sectors. The questions also serve as a checklist for project quality control, evaluation, and troubleshooting. The questions can be readily adapted to a specific sector such as public works (see Appendix B). They also provide a resource for student assignments in education and training programs.

Chapters 5 to 8 are postmortems (case histories) of the Trans-Alaska Pipeline System (construction and operations), the Washington State Five Nuclear Power Plants, and EPA Superfund Programs 1, 2, and 3. These postmortems are analyzed to provide specific examples of the many problems encountered and lessons learned. The analyses clearly show the relationship between fragmentation or lack of teamwork and the problems. The lessons learned in every case emphasize the need for teamwork and accountability. Each case consumed over 1000 hours of research and analyses as a basis for the first draft.

Chapter 9 summarizes postmortems of the spacecraft Challenger disaster and the Hanford Nuclear Reservation. The Challenger postmortem emphasizes the need for engineering and scientific decisions to be upheld by management. Hanford represents a disaster to the environment from nuclear weaponry research and development.

Chapter 10 illustrates the applications of the lessons learned from the case histories in rebuilding our infrastructure and cleaning up the environment. This proposed 10-year program would cost \$35 billion annually, with the money coming from the more than \$65 billion in Corporate Welfare. The program would be a federal-state government partnership. It would be planned, designed, and implemented in the IPQMS framework to ensure accountability, cost effectiveness, and quality. This will be accomplished by IPQMS training programs in each of the 50 states for designers, managers, and contractors.

Appendix A presents abstracts of business case studies, engineering case studies, and IPQMS case histories.

Appendix B contains a sample IPQMS checklist for public works projects. It demonstrates the importance of feasibility studies to provide baseline data for guidelines and checklists for all projects in all sectors.

Appendix C contains the names and professional positions of the international, multidisciplinary team from 1975 to 1983. It also includes contributors from 1984 to 1997.

This book was motivated by many of the authors' friends and colleagues. In particular, the authors thank Dr. John Hawkins, Dean, International Studies and Overseas Programs, University of California Los Angeles, and Dr. Daniel F. Jackson, Professor Emeritus and environmentalist. Dr. Hawkins wrote the foreword, emphasizing the needs to teach teamwork and to develop data banks of IPQMS case histories. Dr. Jackson provided constant encouragement and many suggestions on the entire manuscript. The senior author has valued his colleagueship and friendship for over 30 years. Dr. Jackson envisioned the significance of the IPQMS seminars for training senior government managers.

Special thanks are conveyed to Donald J. Neubauer, P.E., President, Neubauer, Consulting Engineers (Maryland); Gary Wildish, P.E., Management Consultant (Oregon); and Dr. Takeshi Yoshihara, P.E. (Ret. Hawaii) for their comments on the applications of the IPQMS.

Special thanks also go to the Government Accountability Project (GAP) and the Alaska Forum for Environmental Responsibility (AFER). Louis Clark, Executive Director of GAP, and Mike Riley, Executive Director for AFER, have been especially cooperative in providing reference materials on the environmental and public health problems from the Trans-Alaska Pipeline System.

Louis J. Goodman, P.E.
Rufino S. Ignacio

FOREWORD

The utilization of effective tools for project management has been a long sought after goal for engineers and project managers alike. The history of numerous large-scale programs and projects throughout Asia, the Pacific, and the United States reveals the enormous costs and failures brought on when a fragmented approach is used to plan, design, and implement projects in different sectors. Professors Goodman and Ignacio have provided in this volume, a unique and proven planning methodology illustrated in the context of actual projects in a variety of sectors. The Integrated Planning and Quality Management System (IPQMS), developed and refined by the authors over a twenty-year period, represents a breakthrough in providing the policy-maker and practitioner with a valuable tool to guide the development of projects and programs in almost any sector.

The value of this volume is that it illustrates the application of the IPQMS in the context of actual case histories. The use of the case history approach makes this study valuable for scholars and students in the field of higher education, and by practitioners in the actual process of developing and/or running a project. The first four chapters provide a valuable introduction to the concept of the IPQMS; including the four phases of (1) planning, appraisal, and design; (2) selection, approval, and implementation; (3) operation, control, and handover; and (4) evaluation and refinement.

There is a section on the use of the IPQMS in developing case histories and building the concept into the curriculum of both management and engineering courses. This section is particularly important because it discusses in an analytical manner the IPQMS prototype curriculum and the significant differences between case histories and case studies. And, there is a section providing the reader with clear and concise guidelines on how to develop and write a case history. This latter section will be particularly useful for faculty and students at the university level, not only in management and engineering but other fields as well.

However, it is the section on case histories that really brings the IPQMS to life. Here the authors provide several case histories on projects ranging from the Trans-Alaska Pipeline System to the Washington State Five Nuclear Power Plants fiasco and major disasters such as the spacecraft Challenger tragedy. By applying the IPQMS to these and other actual projects the authors are able to demonstrate what went right and what went wrong, and, most importantly, what lessons were learned from each case. Their goal is a laudable one: to provide a practical tool so that future projects can be completed in a competent and accountable way.

In fact, it is this emphasis on accountability that distinguishes this study from so many others that attempt to focus on project management issues. Too often in major projects accountability is diluted and when things go wrong the buck gets

passed. Goodman and Ignacio show how to design and implement a project so that lines of authority are clear and the feasibility of the project is demonstrated from the outset. Then they go on to show how the material presented in the book can be used for more effective training and education of engineers, managers, and other professionals.

It is patently clear that the future of work and development, not just in the United States but worldwide, will require partnerships and teamwork on a scale not known before. The previous economic models of contention and strife, buck-passing and non-transparency, of conflict between labor and management, between professionals and the work force, will no longer sustain us. A new culture of cooperation will have to be constructed and at the core of this culture will be mechanisms like the IPQMS that provide guidelines for producers in all sectors.

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Louis J. Goodman, Professional Engineer, has retired after a 45 year career in national and international engineering education, research, consulting and administration.

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Dedication

*To Phyllis and Marlene with our love for their
encouragement and patience.*

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by John N. Hawkins, Ph.D.

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